



## Product Information:

# Protein Analysis according to GMP Standards

### *GMP-compliant Protein Analysis*

Founded in 1997, Protagen AG has established and successfully expanded a fee-for-service business in protein and peptide analysis. The service platform now comprises protein identification, comprehensive proteome studies, differential protein display, and GMP-compliant protein analysis for quality control of biotherapeutics.

The strong commitment to quality is reflected in the established and authority approved Quality Management system of Protagen AG, and in the experienced staff.

Protagen AG is continuously expanding its customer base and offers customized solutions for the producing pharma industries and contract manufacturing organizations (CMO).

#### **For further information or inquiries please contact:**

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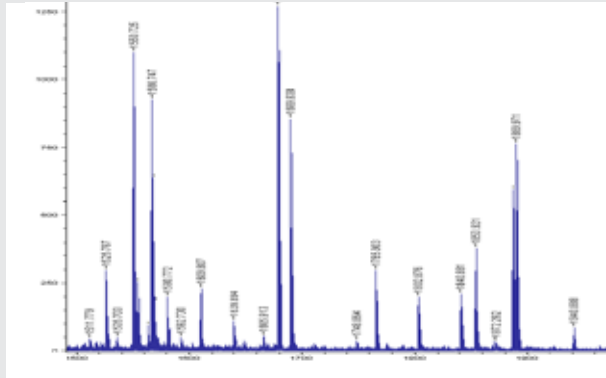
### *Quality Assurance and Regulatory Affairs*



Quality control (QC) and quality assurance (QA) according to GMP standards are decisive to process analysis and batch release analysis. The analytic workflow for all technologies employed for protein analysis is documented in standard operation procedures (SOP), risk analysis, and documentation guidelines. All study results are internally peer-reviewed by our experts providing the customer with a precise evaluation and conclusion.

## Quality Assurance and Regulatory Affairs

Our scientists and skilled technical personnel have a strong background in pharmaceutical and biotechnology R&D. Our employees are highly qualified and participate in internal and external training programs on a



regular basis in full accordance with GMP guidelines. Protagen AG has a proven track record in quality assurance and regulatory affairs:

- ▶ *Regular inspections by German regulatory authorities*
- ▶ *Experience with presentations at national regulatory authorities and EMEA*
- ▶ *Comprehensive and clear GMP documentation*
- ▶ *Validation of analytical methods according to ICH-guidelines*
- ▶ *Internal and external audits*

Since May 2006, Protagen AG is certified for GMP-compliant protein analytical services. Clients are welcome to conduct their own audits.

**ICH Q6B requires:**

**Protagen AG offers:**

ICH Q6B

Analysis	Goal	Established
<b>1. Structural characterization</b>		
Amino acid sequence	Amino Acid Sequence of protein as compared to theoretical sequence	☑
Amino acid composition	Amino acid composition of unknown protein	☑
N/C-terminal sequencing	Identify nature and homogeneity of termini	☑
Peptide map	Confirm identity of protein after digestion	☑
S-S-Bridge analysis	Confirm location and /or connectivity of S-groups	☑
Glycosylation analysis	Sugar content and further analysis (structure, modification site)	☑
<b>2. Physicochemical properties</b>		
Molecular weight (MW) and size	MW of protein	☑
Isoform pattern	Relative quantification of all isoforms	☑
Extinction coefficient (EC)	EC of known substance	☑
Electrophoretic patterns	Show the identity, homogeneity and purity of a substance	☑
Liquid chromatographic patterns	Show the identity, homogeneity and purity of a substance	☑
Spectroscopic Profiles	Determine higher-order structure	Via Partner
<b>3. Process- and product-related impurities</b>		
Host cell proteins	Find contamination via host cell proteins	☑
Truncated forms	Find truncated forms of a protein	☑
Post-translational modifications (PTM)	Identification of PTMs	☑
Aggregates	Find protein complexes	☑

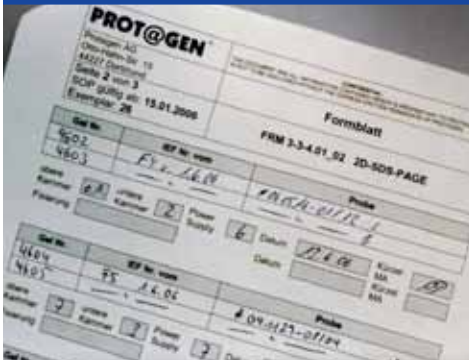
## ICH Q6B - Biotechnological and biological products

Biotechnological and biological products need to be characterized in accordance with ICH-guidelines. Quality guideline Q6B specifies test procedures and acceptance criteria for the analysis of proteins.

Protagen AG provides a comprehensive analytical service package depending on the customers' needs. The table on page two gives an overview of the current status at Protagen AG.



## Technology overview: Expertise and capabilities



Our services range from intensive laboratory research support over routine basic analytical testing to full product characterization. We support our customers with a wide range of analytical methods which are individually combined to give the best possible results.

### Analytical Methods

<b>ELISA</b>	Long lasting experience in development and performance of various ELISA tests. Unique patent protected technology for antibody validation and selection by the UNIchip® protein biochips product family.
<b>1D Gel Electrophoresis</b>	Can be performed under reducing and non-reducing conditions. Separation length of up to 30 cm, various staining protocols can be applied.
<b>2D Gel Electrophoresis</b>	High resolution protein separation via 2D gels with maximal size of 40 x 30 cm. Various staining protocols can be applied.
<b>Western Blotting</b>	Technique can be used in combination with 1D or 2D gel electrophoresis. Antibody selection and validation via unique in-house technology by protein biochips.
<b>HPLC</b>	State-of-the-art equipment with method specific accessories, e.g. HPAED detector for glycosylation analysis
<b>Amino Acid Analysis</b>	Standard amino acid analysis as well as modified time-resolved analysis for better accuracy of quantification.
<b>Protein Quantification</b>	Microtiter plate based quantification technique, fully validated and developed by Protagen AG, with excellent reproducibility and high robustness.
<b>UV-Absorption</b>	Measurements at one specific wavelength for scanning or acquisition of multi-wavelength spectra.
<b>Mass Spectrometry (MS)</b>	<ul style="list-style-type: none"> <li>▶ Peptide Map, both <b>P</b>eptide <b>M</b>ass <b>E</b>fingerprint (PMF via MS) and <b>P</b>eptide <b>F</b>ragmentation <b>E</b>fingerprint (PFF via MS/MS) to confirm identity of proteins. Our MS delivers more information of analyzed proteins than the officially recommended test method by HPLC.</li> <li>▶ N- and C-terminal sequencing for sequence determination of entire proteins from both termini. Especially for efficient sequence determination from the C-terminus, Protagen AG has developed and applies a powerful and robust mass spectrometric technique, using In-Source Decay (ISD).</li> <li>▶ LC-ESI-MS/MS, especially for complex protein mixtures, hydrophobic proteins and/or in-depth protein analysis.</li> </ul>

## Comprehensive testing and analysis procedures are our speciality

Protagen AG provides comprehensive support for the Life Science Industry. The excellent knowledge in protein analysis has already served numerous customers in R&D of biosimilars and biotherapeutics. Protagen AG is also prepared to establish and to perform the methods required by the Pharmacopoeia.

If you think about outsourcing all of your GMP-release analytics, if you want to avoid intensive investments in costly analytical equipment, or if you simply try to cope with capacity overloads, Protagen AG will provide the solution.

We offer the following services:

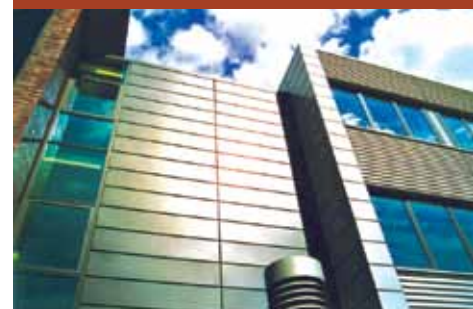
- ▶ *Release and lot testing*
- ▶ *Full structural elucidation of a protein*
- ▶ *Stability testing (e.g. Oxidation, Freeze/Thaw-Cycles, Elevated temperatures, UV-Radiation)*
- ▶ *Analysis of complex protein mixtures (e.g. somatic cell therapeutics)*
- ▶ *Comparability testing of complex protein mixtures*
- ▶ *Optimization of production processes*
- ▶ *Analysis of therapeutic mechanisms*

Additionally, we provide a customized method development or service packages to meet your company's needs. Please contact us to discuss your specific requirements.

## Key advantages and customer benefits at a glance

Advantage	Customer Benefit
Fast and flexible partner	<ul style="list-style-type: none"> <li>▶ Shorter time-to-market for your products</li> <li>▶ Long-term partnership</li> </ul>
Access to a broad range of protein analytical methods	<ul style="list-style-type: none"> <li>▶ Reliable solutions for routine analyses as well as for special analyses</li> </ul>
Ability to develop state-of-the-art analytical methods	<ul style="list-style-type: none"> <li>▶ Custom-tailored and validated analytical solutions</li> <li>▶ Dedicated partner for development of new products</li> </ul>
Transfer of methods in or out according to customer needs	<ul style="list-style-type: none"> <li>▶ Flexible business models to manage costs efficiently</li> </ul>
Comprehensive and stringent project management	<ul style="list-style-type: none"> <li>▶ Clear and well-defined communication on project progress</li> <li>▶ Detailed project plan with defined milestones to meet your desired deadlines</li> </ul>
Long-lasting industrial experience	<ul style="list-style-type: none"> <li>▶ Ability to understand customers' needs</li> </ul>
Guaranteed compliance with current GMP regulations	<ul style="list-style-type: none"> <li>▶ Safety for your business</li> </ul>
Experience with regulatory authorities	<ul style="list-style-type: none"> <li>▶ Support and accompaniment at regulatory authorities during market authorization (e.g. EMEA)</li> <li>▶ Focus on your core business and competencies</li> </ul>

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**PROT@GEN**®

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